IN THE SPECIFICIATION:

Please replace the table of page 2 with the following:

TABLE 1

PATENT NO.	INVENTOR(S)	ISSUE DATE
US 4,303,075	Heilman et al.	Dec., 1981
US 5,330,511	Boute	July 19, 1994
US 5,534,016	Boute	July 9, 1996
US 5,560,368	Berger	October 1, 1996
US 5,713,930	van der Veen et al	Feb. 3, 1998
~~US appln. S.N.~~	~~Alber et. al~~	~~(pending)~~

IN THE CLAIMS:

1. (Original) An implantable cardiac pacing system capable of delivering atrial pace signals at a determined pacing rate and synchronously generating ventricular pace signals at a determined AV delay following delivery of atrial pacing signals and including an AV delay optimizing subsystem, said AV delay optimizing subsystem comprising:

test means for initiating a test to determine an optimal AV delay corresponding to a pacing rate at about a lower rate limit (LRL);

rate means for setting a cardiac pacing rate at or near the LRL;

AV delay means for varying a AV delay interval value to each one of a plurality of respective AV values and for maintaining the AV delay interval value at each said respective AV value for a time t;

QT means operative during the time t of each maintained AV delay value for measuring variation of QT over said time t and for determining a QT differential (QTD) over said time t; and

optimizing means for determining the optimal AV delay, wherein said optimal AV delay corresponds to a minimal QTD, and for programming said optimal AV delay as an operating AV delay.

2. (Original) A system according to claim 1, wherein said QT means comprises means for determining QTmax and QTmin during each said time t and means for determining the difference between QTmax and Qtmin to provide said QTD.

3. (Original) A system according to claim 1, comprising timing means for setting said time t to a predetermined value less than about 10 seconds.

4. (Original) A system according to claim 1, comprising timing means for setting said time to a predetermined number of discrete cardiac cycles.

5. (Original) A system according to claim 1, wherein said AV delay means comprises increment means for setting said AV delay values to a predetermined low value (AVmin) plus an integer (n) multiplied by a difference in time (ΔT), and program means for programming operating values of AVmin, n and ΔT.

6. (Original) A system according to claim 1, wherein said AV means comprises program means for automatically cycling through each of said plurality of respective AV values.

7. (Original) A system according to claim 1, comprising evaluation means for evaluating the minimal value of QTD and for changing the AV delay to the value corresponding said minimal value if said minimal value differs significantly from QTD of the AV value prior to initiating said test.

8. (Original) A system according to claim 1, wherein said test means comprises storage means for a storing test criteria and monitoring means for determining that said test criteria are met before initiating a said test.

9. (Original) A system according to claim 8, wherein said storage means stores criteria for a pacing mode and a QT stability value.

10. (Original) A system according to claim 1, comprising AV(r) means for generating an AV(r) curve based on said optimized AV delay.

11. (Original) An implantable pacing system for pacing a patient's heart, having means for generating and delivering atrial pace signals at a determined pacing rate and means for generating ventricular pulses at a determined AV delay following an atrial pace event, and including an AV optimizing subsystem, said AV optimizing subsystem comprising:

test means for initiating a test to determine an optimal AV delay corresponding to a pacing rate near a lower rate limit (LRL);

rate means for setting pacing rate near the LRL;

AV delay means for providing a set of respective base values of the AV delay;

setting means for setting a base value of each of the set of respective base values of the AV delay to each respective one of said set of base values and maintaining said base value for a predetermined duration, the test comprising a duration for each of the set of base values;

modulation means for modulating discrete delay intervals to a plurality of test AV delay values, wherein said plurality of test AV delay values are near each of the set of base values during each said duration;

QT variation means operative during each said duration for determining a change in QT (dQT) during the performance of the modulating function by the modulation means for each of the set of base values;

minimum means for determining the minimum dQT from a set of dQT values derived from the set of base values; and

optimizing means for setting an optimal AV to the base AV value corresponding to said minimum dQT.

12. (Original) A system according to claim 11, wherein said modulation means comprises a programmable apparatus.

13. (Original) A system according to claim 12, wherein said modulation means comprises means for incrementally increasing and decreasing a test AV delay with respect to each of the set of the base values during each duration.

14. (Original) A system according to claim 12, wherein said modulation means comprises means for increasing AV delay in n predetermined discrete steps and for decreasing AV delay in n predetermined discrete steps, whereby the AV delay

is increased and decreased with respect to the base AV delay during each said duration.

15. (Currently Amended) A system according to claim ~~12~~14, wherein said modulation means comprises a programmable storage structure for holding the value of n and the value of said discrete steps, and n=1.

16. (Original) A system according to claim 15, where n equals at least 2.

17. (Original) A system according to claim 11, wherein said AV means comprises a set of m programmable base values.

18. (Original) A system according to claim 17, wherein said optimizing means comprises means for determining when said minimum dQT is significantly different from a prior dQT determined prior to said test, and for not altering a prior operating AV delay when the optimized AV delay it is not significantly different from the prior operating AV delay.

19. (Original) A system according to claim 18, comprising means for automatically repeating said test within a predetermined time following a determination that said minimum dQT is not significantly different.

20. (Original) A system according to claim 11, further comprising program means for programming said test to be completed in less than about ten minutes.

21. (Original) A system according to claim 11, comprising program means for programming each duration to be completed in less than about 10 cardiac cycles.

22. (Original) A system according to claim 11, comprising AV(r) means for generating an AV(r) curve that includes said optimal AV delay.

23. (Withdrawn) A method of finding an optimal AV delay at or about a lower rate limit (LRL), for use in an implantable pacemaker in an A-V synchronous mode, comprising:

delivering pacing stimulus at about a LRL;

setting a test AV delay to at least one predetermined base AV delay value at or near a base AV delay value for a predetermined duration;

obtaining an instability response for each cardiac cycle during said predetermined duration;

calculating a metric of the instability response during said predetermined duration; and

determining whether said test AV delay is optimal as a function of said instability response.

24. (Withdrawn) A method according to claim 23, comprising carrying out said setting, obtaining and calculating steps for a plurality of respective different test AV delays, and determining an optimum AV value by comparing each metric of the instability response.

25. (Withdrawn) A method according to claim 24, wherein said obtaining step comprises obtaining a QT interval for each cardiac cycle.

26. (Withdrawn) A method according to claim 25, wherein each said setting step comprises setting AV delay at a respective programmed base value, and each said calculating step comprises calculating QTD at the programmed base AV value.

27. (Withdrawn) A method according to claim 25, wherein each said setting step comprises setting the test AV delay at a respective base value, and further comprising modulating the test AV delay during a duration t for each respective programmed AV base value.

28. (Withdrawn) A method according to claim 24, wherein said determining step comprises determining an optimal AV delay that corresponds to a minimum instability response.

29. (Withdrawn) A method according to claim 28, wherein each said setting step comprises setting the test AV delay to a respective programmed value, each said calculating step comprises calculating QTD at the programmed test AV value, and said determining step comprises selecting the optimal AV as the AV setting corresponding to the calculated minimum QTD.

30. (Withdrawn) A method according to claim 28, wherein each said setting step comprises setting the test AV delay to a respective programmed base value, and further comprising modulating the test AV delay during the said duration for each respective said programmed AV base value.

31. (Withdrawn) A method according to claim 23, comprising first determining whether a QT interval is relatively stable, and

in the event that the QT interval is relatively stable, then:

carrying out the steps of claim 23 to determine an optimal value of AV delay.

32. (Withdrawn) A method according to claim 23, comprising further testing to determine an optimal value of AV delay at a rate different from LRL, and determining and storing an AV=f(rate) curve.

33. (Original) An implantable pacing device having structure to support a dual chamber synchronous pacing modality, comprising a system for optimizing an operating AV delay, said system comprising:

T wave variation means for measuring T wave variation over a short time duration for each of a plurality of predetermined values of AV delay; and

optimizing means for determining a predetermined value of AV delay for which the least T wave variation was found, and for setting AV delay as said determined value.

34. (Original) A device according to claim 33, wherein said T wave variation means comprises QT means for cyclically obtaining a measure of QT.

35. (Original) A device according to claim 34, comprising base means for determining base values of AV delay, and modulating means for modulating AV delay around each said base value.

36. (Original) A device according to claim 34, comprising means for setting the AV delay at each of a plurality of predetermined values for a predetermined time interval and means for obtaining a measure of QT variation during each said predetermined time interval.

37. (Original) A device according to claim 34, further comprising test means for storing a plurality of optimization tests, and select means for selecting the optimization test to be performed.

38. (Original) A device according to claim 37, comprising reprogram means for reprogramming the test following a said test.

39. (Original) A device according to claim 37, comprising rate means for setting a paced heart rate at which a said test is performed.

40. (Original) A device according to claim 39, wherein said rate means comprises LRL means for setting said paced heart rate at about the device LRL.

41. (Original) A device according to claim 40, wherein said rate means comprises means for setting said paced heart rate at a plurality of respective rate values.

42. (Withdrawn) A method of testing to determine the optimal value of an operating AV delay for use at about a lower rate limit (LRL) in a cardiac pacing device, comprising:

measuring T wave variations over a short time duration for a plurality of predetermined values of AV delay;

comparing said T wave variations and determining a minimum T wave variation and an AV delay corresponding thereto; and

programming an operating AV delay with the AV delay corresponding to said minimum T wave variation.

43. (Withdrawn) A method according to claim 42, further comprising testing at approximately the LRL.

44. (Withdrawn) A method according to claim 43, further comprising testing at a plurality of pacing rates.

45. (Withdrawn) A method according to claim 42, further comprising measuring a QT variation.

46. (Withdrawn) A method according to claim 45, further comprising measuring the QT variation at a predetermined AV delay.

47. (Withdrawn) A method according to claim 46, comprising measuring the QT variation at a preexisting operating AV delay used before start of the test, and leaving the preexisting operating AV delay unchanged if the QT variation at such AV delay meets predetermined criteria.

48. (Withdrawn) A method according to claim 42, further comprising:

storing on a computer readable medium disposed within said device a plurality of AV optimization tests;

determining if a QT interval is relatively stable; and

selecting and performing a select one of said plurality of AV optimization tests.

49. (Withdrawn) A method according to claim 48, further comprising:

determining when a different test of said plurality of AV optimization tests is to be performed; and

performing said different test.

50. (Withdrawn) A method according to claim 49, wherein the step of determining when the different test is to be performed comprises determining whether a completed test has indicated a significant change in optimal AV delay.

51. (Withdrawn) A method according to claim 49, wherein the step of determining when the different test is to be performed comprises determining whether there is significant QT variation at the current AV delay.

52. (Withdrawn) A computer readable medium for storing executable instructions for performing a method of testing to determine the optimal value of an operating AV delay for use at about a lower rate limit (LRL) in a cardiac pacing device, comprising:

instructions for measuring T wave variations over a short time duration for a plurality of predetermined values of AV delay;

instructions for comparing said T wave variations and determining a minimum T wave variation and an AV delay corresponding thereto; and

instructions for programming an operating AV delay with the AV delay corresponding to said minimum T wave variation.